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भारतीय मानक

मौसम विज्ञान प्रयोजन के लिए गति स्केल सैट

Indian Standard

VELOCITY SCALE SET FOR METEOROLOGICAL PURPOSES

ICS 07.060

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

December 2002

Price Group 3

Meteorological Instruments Sectional Committee, BP 21

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Meteorological Instruments Sectional Committee had been approved by the Basic and Production Engineering Division Council.

In the preparation of this standard, considerable assistance has been derived from the JSS 6660-10:1995 'Velocity scale set for meteorological purposes'.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

VELOCITY SCALE SET FOR METEOROLOGICAL PURPOSES

1 SCOPE

This standard covers the general and functional requirements of rigid velocity scale sets used for determining the wind speed from the plotted hodograph of the pilot balloon ascents for meteorological purposes.

2 DESCRIPTION

2.1 The velocity set scale shall either consist of 3-scales or a square with its four edges suitably graduated. In case of 3-scale set, one each is to be used for different portions of the hodograph plotted with the following scale factors:

a) 1 km = 1 cm
b) 1 km = 2 cm
c) 1 km = 4 cm

2.2 There are mainly two types of the velocity set:

a) Plastic scales (*see* Fig. 1 and 2), and
b) Metal scales (*see* Fig. 3).

2.2.1 *Plastic Scales*

There are two types of plastic scales:

a) Plastic scales (flat) — Set of 3 scales (*see* Fig. 1), and
b) Plastic scales — Square (flat) (*see* Fig. 2).

2.2.2 *Plastic Scales* (*Flat*)

2.2.2.1 Each scale of the set of 3 scales shall be graduated on both the edges. One edge of the scale shall be graduated in metres per second (m/s) for use if the time interval on the hodograph between two successive points is two minutes and the other one shall be graduated in metres per second (m/s) for use if the time interval is one minute.

2.2.2.2 When kept in horizontal position, scales shall have graduation from left to right on top edge and in reverse direction on the bottom edge.

2.2.2.3 The graduation on each edge shall be such that the least count of the scales is 1 m/s except in the case of the scale for use with one minute interval having scale factor 1 cm = 1 km wherein the least count shall be 2 m/s. For this purpose, the successive marks in the scales having least count of 1 m/s shall have the following distance between them:

Scale Factor	*Time Interval*	
	2 min	*1* min
1 cm = 1 km	1.4 mm	Not applicable
2 cm = 1 km	2.4 mm	1.2 mm
4 cm = 1 km	4.8 mm	2.4 mm

The successive marks on the scale having the least count of 2 m/s (Scale Factor 1 cm = 1 km, Time Interval 1 mm) shall have distance of 1.2 mm.

NOTE — Schematic drawing of plastic scales (flat) may be referred to in Fig. 1.

2.2.3 *Plastic Scales — Square (Flat)*

2.2.3.1 In case of a square scale, the four edges shall be graduated for the following scale factors:

a) 1 cm = 1 km : 1 min interval [1]

b) 1 cm = 1 km : 2 min interval [1]
2 cm = 1 km : 1 min interval [1]

c) 2 cm = 1 km : 2 min interval [1]
4 cm = 1 km : 1 min interval [1]

d) 4 cm = 1 km : 2 min interval [1]

2.2.3.2 The least count of the scale graduated in accordance with **2.2.3.1** shall be 2 m/s. For the rest of the scales, the least count shall be 1 m/s. The distance between the consecutive marks of the scale on each of the edge shall be as follows:

Scale Factor	*Time Interval*	*Least Count*	*Distance Between Consecutive Marks*
1 cm = 1 km	1 min	2 m/s	1.2 mm
1 cm = 1 km 1 cm = 1 km	2 min 1 min	1 m/s	1.2 mm
1 cm = 1 km 1 cm = 1 km	2 min 1 min	1 m/s	2.4 mm

NOTE — Schematic drawing of plastic scales — Square (flat) may be referred to in Fig. 2.

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[1] Refers to time interval on the hodograph between two successive points.

2.2.4 *The Length of Graduation Lines in Case of Plastic Scales* — Flat and square shall be as follows:

a) Scales having least count of 1 m/s:
  - i) 1 m/s marks : 5 mm
  - ii) 5 m/s marks : 8 mm
  - iii) 10 m/s marks : 10 mm

b) Scales having least count of 2 m/s:
  - i) 2 m/s marks : 5 mm
  - ii) 10 m/s marks : 10 mm

NOTE — This scale shall not have 5 m/s marks.

2.2.5 *Metal Scales*

2.2.5.1 The metallic scales (of the set) shall have flat section with one beveled edge. The beveled edge shall be graduated and shall be used for making measurements. The graduation shall run from left to right when the scale is kept in horizontal position with beveled edge forming the top edge.

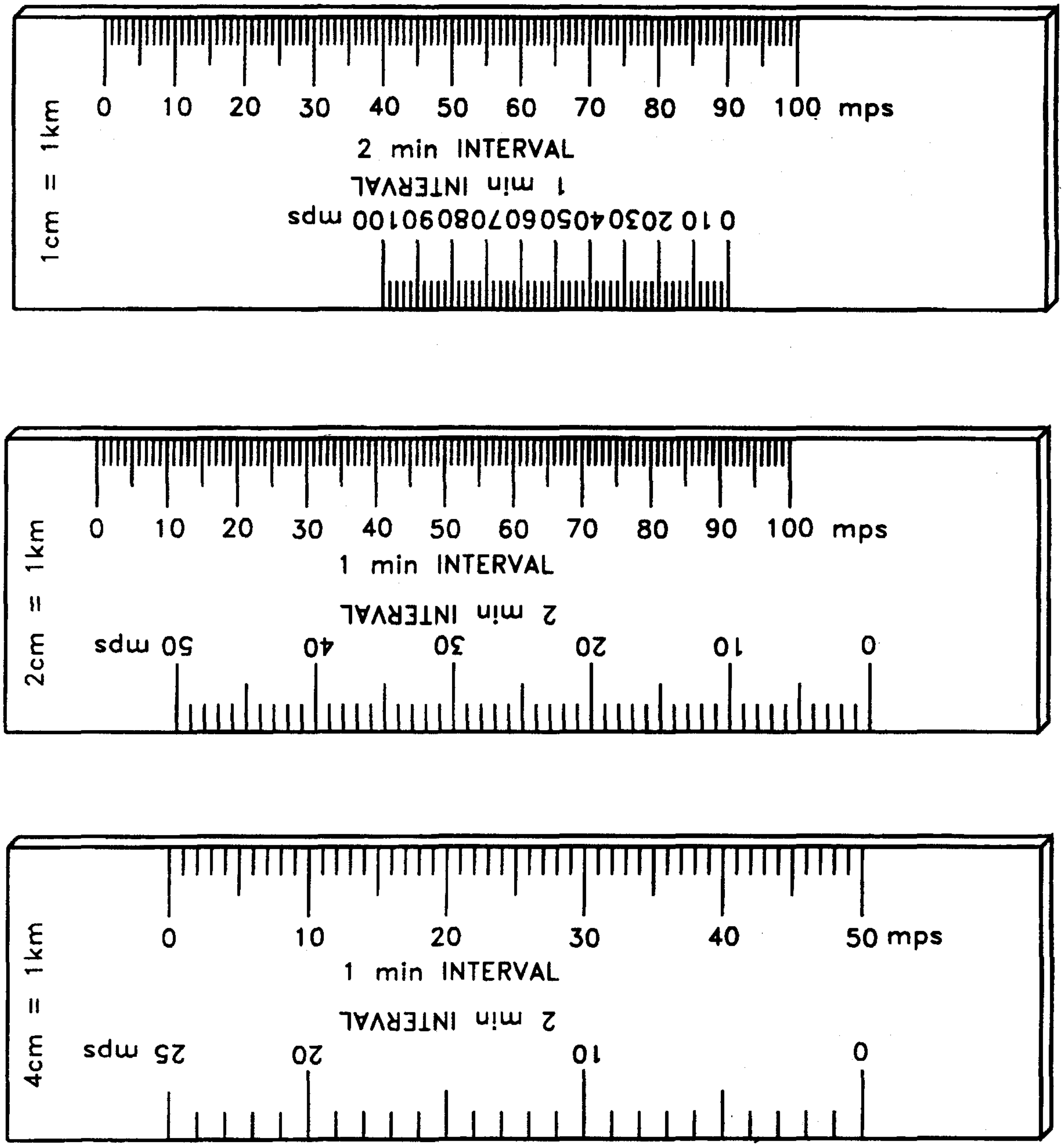


FIG. 1 VELOCITY SCALE SET, TYPE: PLASTIC SCALE (FLAT) — (SET OF 3 SCALES)

2.2.5.2 The graduation shall indicate the wind speed in m/s from two minutes time interval between two successive points of the hodograph.

2.2.5.3 The first interval of 10 m/s shall be so marked that 10 m/s mark is on the left and 0 (zero) m/s mark on the right. Thereafter graduations shall be provided for every 5 m/s.

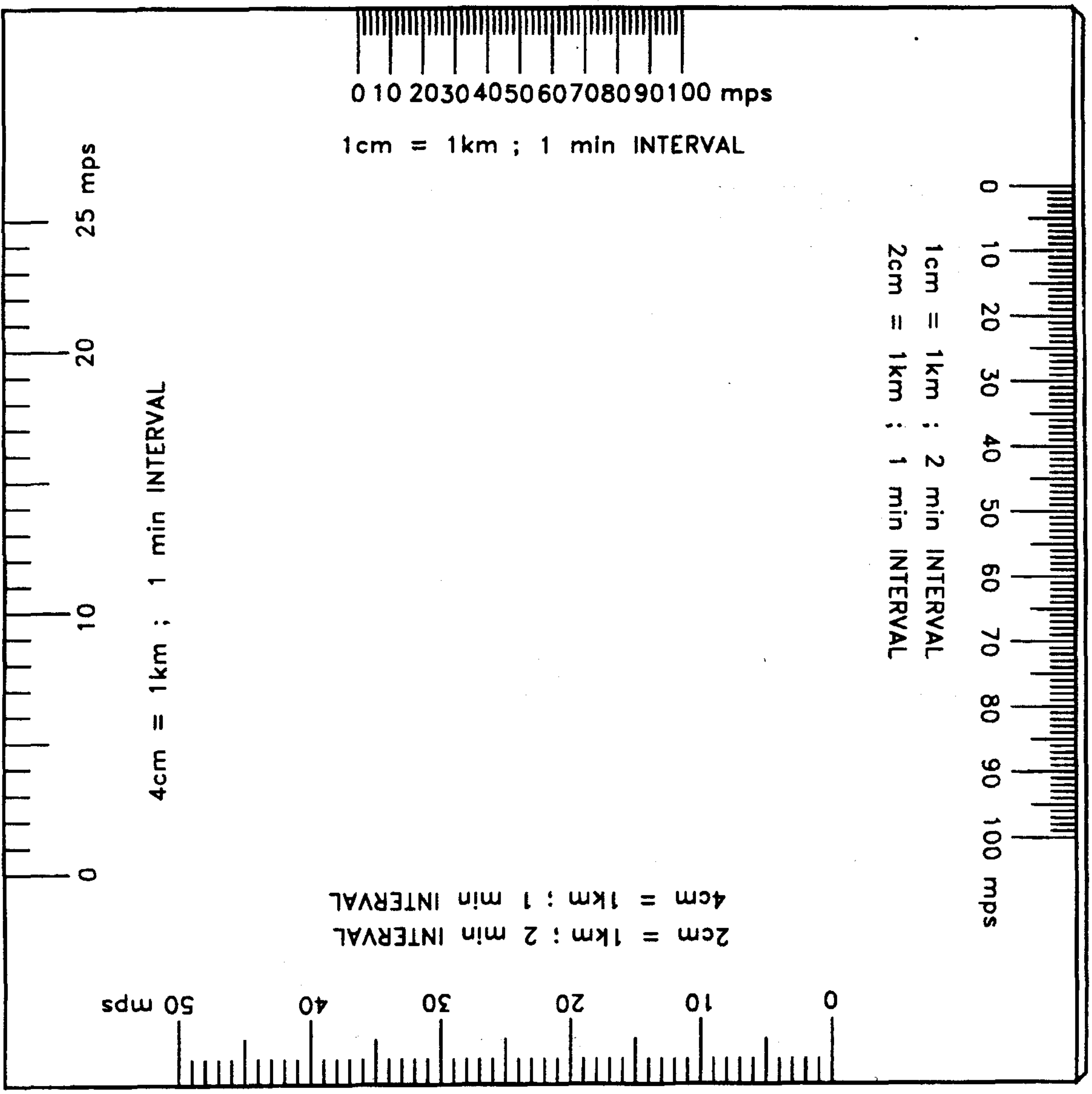
NOTE — Schematic drawing of the scales are illustrated in Fig. 3.

2.2.5.4 The successive marks at interval of 1 m/s and 5 m/s on each of the scales of the set shall have the following distance between them:

Scale Factor	*Time Interval*	
	1 m/s	5 m/s
1 cm = 1 km	1.2 mm	6.0 mm
2 cm = 1 km	2.4 mm	12.0 mm
4 cm = 1 km	4.8 mm	24.0 mm

2.2.5.5 The length of graduation lines shall be as follows:

a) 1 m/s mark - 5 mm
b) 5 m/s mark - 8 mm
c) 10 m/s mark - 10 mm



0 10 20 30 40 50 60 70 80 90 100 mps
1cm = 1km ; 1 min INTERVAL
0 10 20 30 40 50 60 70 80 90 100 mps
1cm = 1km ; 2 min INTERVAL
2cm = 1km ; 1 min INTERVAL
0 10 20 25 mps
4cm = 1km ; 1 min INTERVAL
4cm = 1km ; 1 min INTERVAL
2cm = 1km ; 2 min INTERVAL
0 10 20 30 40 50 mps

FIG. 2 VELOCITY SCALE SET, TYPE: PLASTIC SCALE — SQUARE (FLAT)

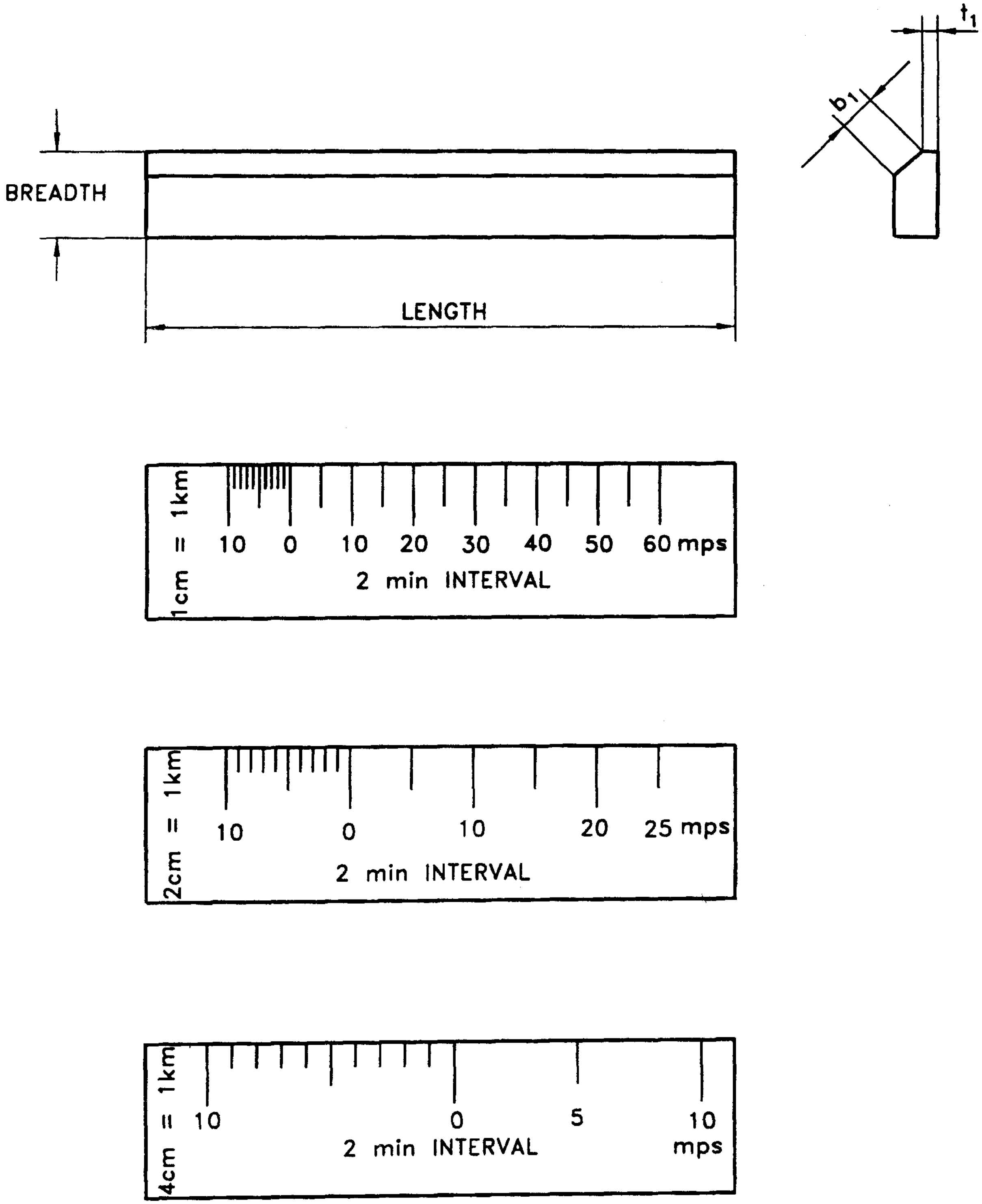


FIG. 3 VELOCITY SCALE SET : METALLIC

3 DIMENSIONS

The principal dimensions of each of the scales of the set shall be as given below:

Scale	*Length* (mm)		*Breadth* (mm)		*Thickness* (mm)	
	Max	*Min*	*Max*	*Min*	*Max*	*Min*
a) Metal Scales (One beveled edge)	105	100	15	14	3.5	2.5
b) Plastic Scales (Flat) set of 3 scales	160	155	45	40	2.5	2.0
c) Plastic Scales — Square (Flat)	160	155	160	155	2.5	2.0

The schematic drawings of the scales referred to above are given in Fig. 1, 2 and 3

where

b_1 = Width of beveled edge 4 ± 1 mm for metal scale.

t_1 = Remaining thickness of beveled edge 1 mm for metal scale.

4 MATERIAL

The velocity scale set shall be made of plastic or metal.

4.1 Plastic Scale

4.1.1 The material for the manufacture of plastic scales (of the velocity scale set) or square plastic scale shall be polyvinyl chloride or polyvinyl chloride copolymer sheets or any other similar material.

4.1.2 The scales shall be made from plastic which shall be uniform in width and thickness throughout the entire length.

4.2 Metal Scale

4.2.1 The material for the manufacture of metallic velocity scale set shall be good quality rust resistant spring steel or manganese spring steel having 0.55 to 0.65 percent carbon and 0.60 percent manganese or suitable grade of stainless steel. The coefficient of expansion of steel shall be $(11.0 \pm 1.5) \times 10^{-6}$ mm °C within the range of 0 to 60°C.

4.2.2 The blanks for metallic velocity scale set cut from sheets or strips, shall be uniform in thickness and width throughout the entire length. The blanks shall be free from seams, flaws, scales, burrs or other defects.

5 WORKMANSHIP AND FINISH

5.1 The plastic scales shall be smooth, even on all the sides and free from blisters, porosity, etc.

5.1.1 The plastic scales shall be uniform in width and thickness throughout the entire length.

5.2 The metal scales shall be free from seams, flaws, scales, burrs, etc.

5.2.1 The metal scales shall be uniform in thickness and width throughout the entire length.

5.3 The edges of scales (Plastic or metal scales) shall not deviate from a straight line by more than 0.5 mm and their plane surfaces shall not vary from a plane by more than 0.5 mm at any point.

5.4 The surfaces and edges of the scales shall be smoothly finished.

5.5 The Graduation lines of scales shall be fine, clear and of uniform thickness of not more than 0.1 mm. The lines shall be of sufficient depth to maintain legibility and indelibility.

5.6 The metal scales shall be suitably hardened and tempered. All metal scales shall be smeared with a thin coating of mineral jelly or any other suitable preservative.

6 TESTS

6.1 Visual

The scale shall be examined visually for the following aspects:

a) Uniformity of scales in width and thickness throughout the entire length (*see* **5.1.1** and **5.2.1**).

b) Smoothness and evenness of all sides of scale (*see* **5.1** and **5.3**).

c) Finish of surfaces and edges of scales (*see* **5.4**).

d) Plastic scale for any blisters, porosity or any other defects (*see* **5.1**).

e) Metal scale for any seams, flaws, scales, burrs or any other defects (*see* **5.2**).

f) Graduation lines for fineness, clarity uniform thickness (*see* **5.5**).

g) Legibility and indelibility of graduation lines (*see* **5.6**).

6.2 General Accuracy Tests

6.2.1 The principal dimensions of each of the scales of the set shall be as per **3**.

6.2.2 The graduation lines shall be fine, clear and of uniform thickness of not more than 0.1 mm. The lines shall be of sufficient depth to maintain legibility and indelibility. The length of graduation lines shall be as follows:

a) 1 m/s marks — 5 mm [Applicable to scales having 1 m/s least count]

b) 5 m/s marks — 8 mm [Applicable to scales having 1 m/s least count]

c) 2 m/s marks — 5 mm [Applicable to scales having 2 m/s least count]

6.2.3 Metal scales when compared against a certified metal scale at 27° C, tolerance on the various graduations of the scale shall not exceed the following limits:

a)	Between any two consecutive marks (of 1 or 5 m/s) required to be separated by 1 cm or less	± 0.02 mm
b)	Between any two marks up to and including the entire length of scale required to be separated by more than 1 cm.	± 0.05 mm

7 MARKING

7.1 Each scale of the set will have the following information indelibly and legibly etched or engraved on:

a) Scale factor, that is, 1 cm = 1 km/2 cm = 1 km/ 4 cm = 1 km.

b) Unit of velocity m/s.

c) Time interval (for which the scale is to be used), that is, 1 and 2 minute interval.

7.2 The mark for 10 m/s and its multiple on each of the scale shall be numbered clearly. The height of the figures shall be not less than 2 mm.

7.3 Each set of scale shall be allotted a serial number by the manufacturer. This along with figure 1, 2 or 3 shall be engraved/ etched legibly and indelibly on the different scales of the set as per the following scheme:

a) 1 cm = 1 km scales : Manufacturer's No.1

b) 2 cm = 1 km scales : Manufacturer's No.2

c) 4 cm = 1 km scales : Manufacturer's No.3

The height of each figure shall not be less than 2 mm.

7.4 In case of plastic square scale, only manufacturer's number shall be marked.

7.5 In addition to the above marking, the following shall also be marked on the scales:

a) Manufacturer's code;

b) Nomenclature; and

c) Year of manufacture.

7.6 BIS Certification Marking

The product may also be marked with the Standard Mark.

7.6.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 PACKAGING

8.1 All metal scales shall be individually wrapped in grease-proof paper and the set of 3 scales shall then be packed in cardboard cartons.

8.2 Individual plastic scales shall be wrapped in tissue paper and then the set of 3 scales shall be packed in cardboard cartons.

8.3 Plastic square scales shall be wrapped in tissue paper and shall then be packed in suitable carton.

8.4 Each carton shall be marked with the following:

a) Manufacturer's code;

b) Nomenclature; and

c) Year of manufacture.

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